SDS Overview

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POIWG #41

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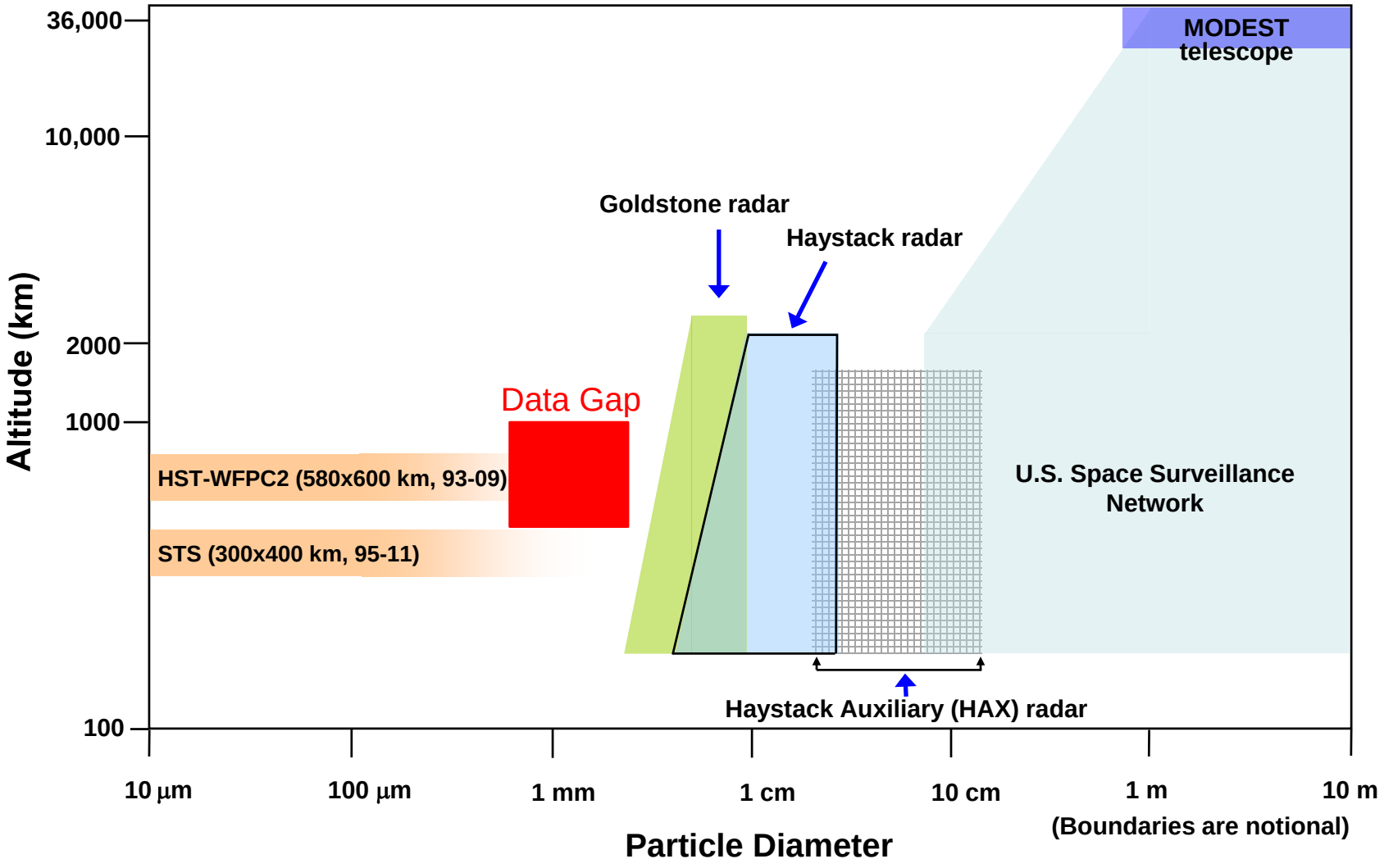
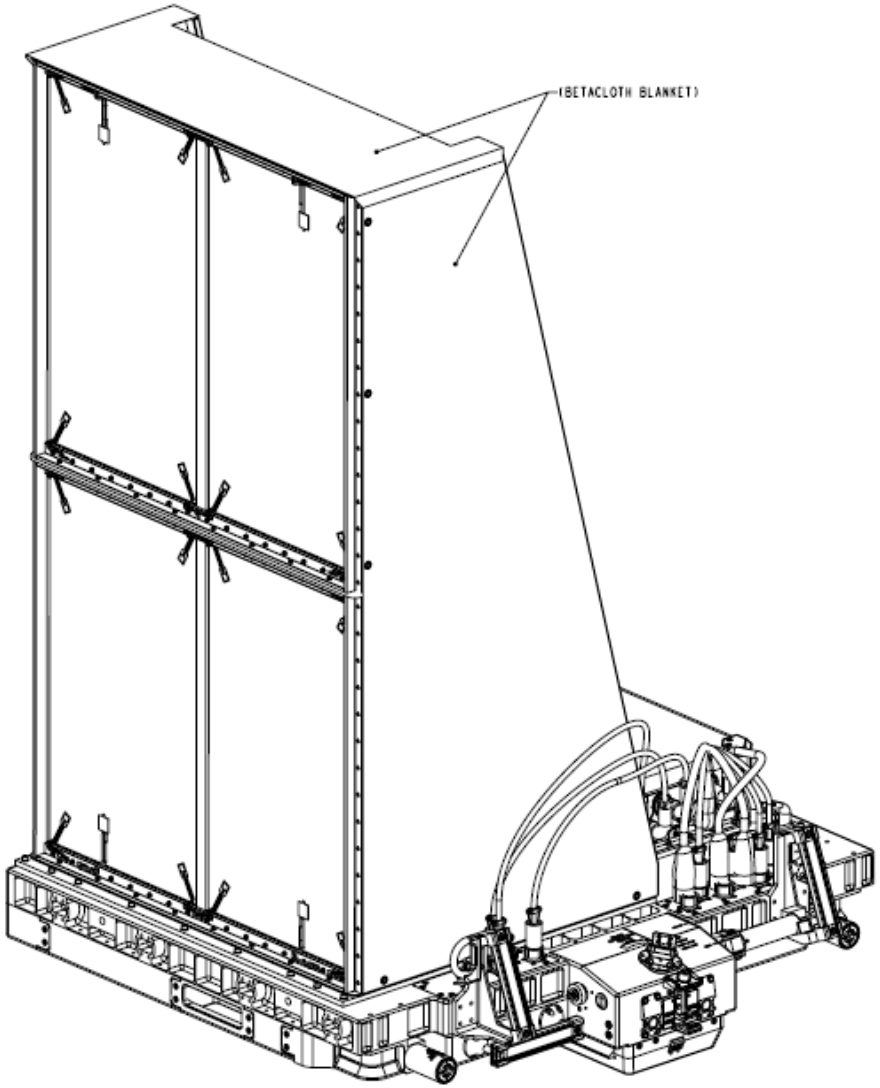
SDS Background

- The Space Debris Sensor (SDS) is a NASA experimental payload scheduled to fly aboard the International Space Station (ISS) starting in 2017
- First flight demonstration of the Debris Resistive/Acoustic Grid Orbital NASA-Navy Sensor (DRAGONS) developed and matured by the NASA Orbital Debris Program Office (ODPO)
- SDS will provide statistical in-situ data on the orbital debris population that is too small for ground-based remote sensing
  - Information on debris ranging from 50 µm to 500 µm in size
  - Estimates of this small debris population are currently based on inspection of exposed surfaces returned on Shuttle (retired 2011)
  - Results will be used to update the ODPO Orbital Debris Engineering Model (ORDEM)

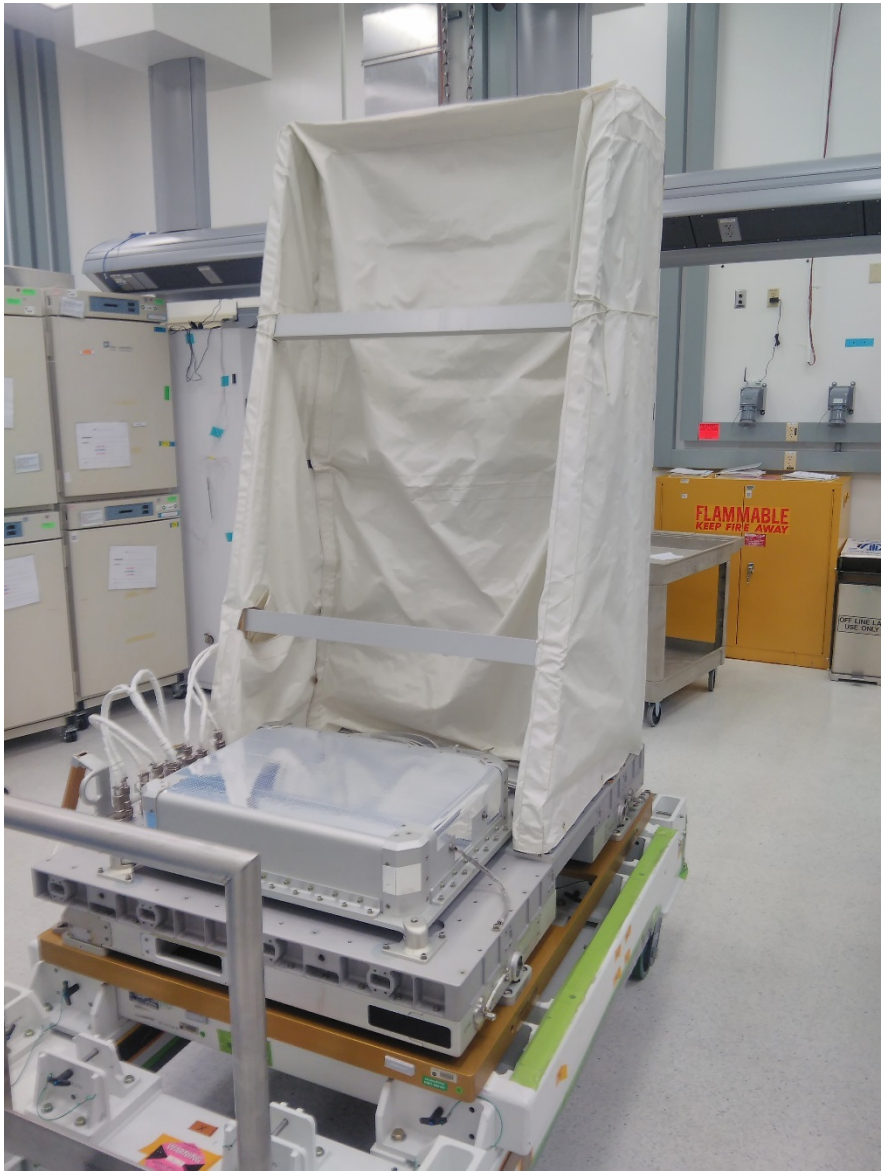
Orbital Debris Measurement Coverage



SDS Front View



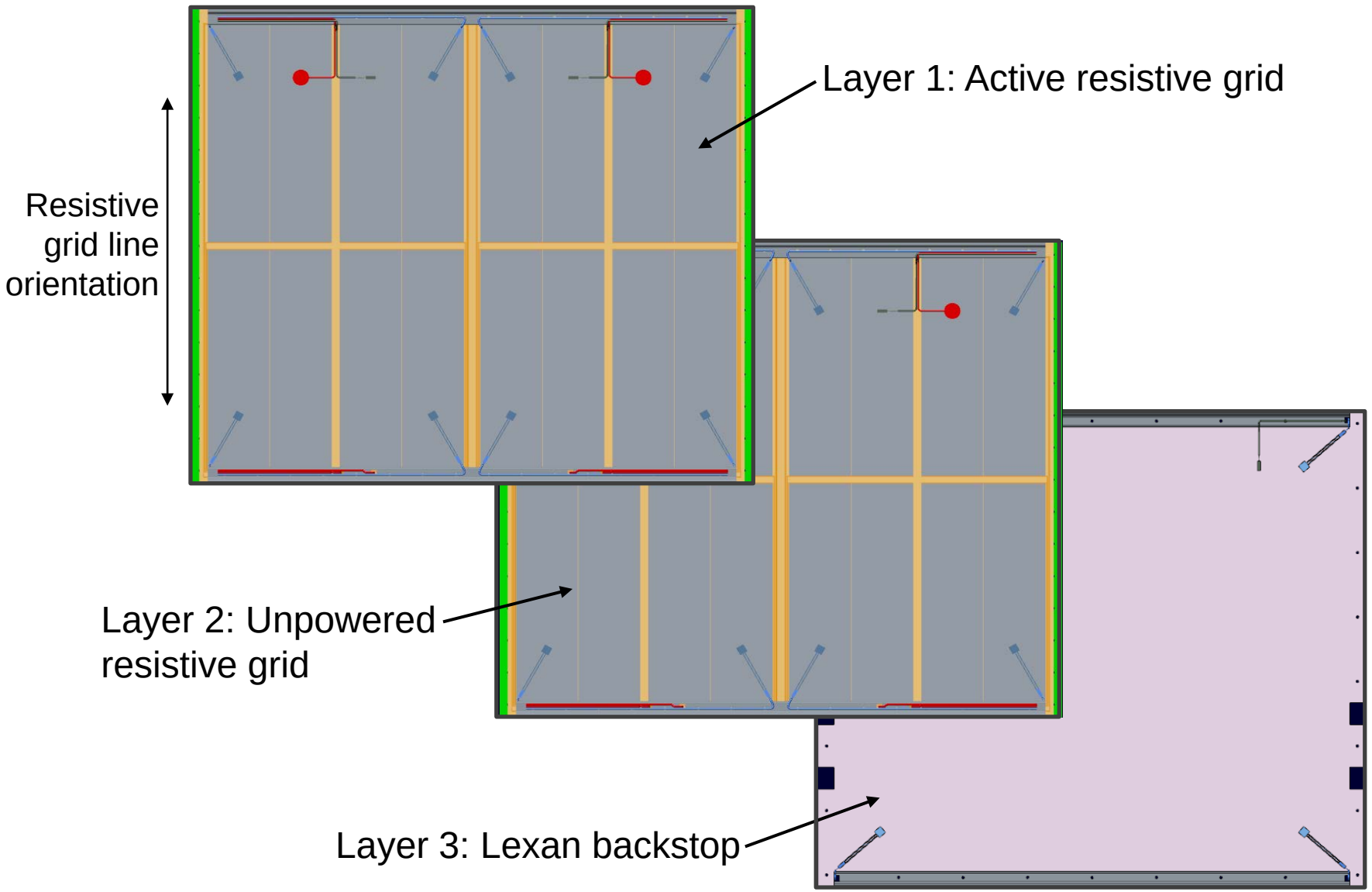
SDS Rear View



Vital Statistics

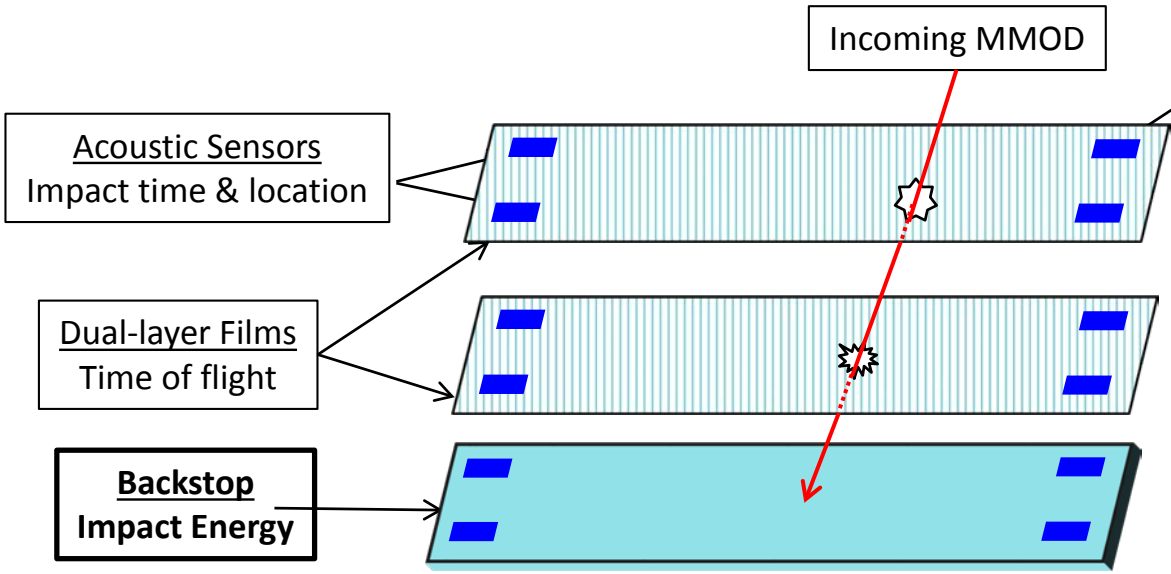
- Weight:
  - Total: 267.69 kg / 590 lbs
  - Columbus External Payload Adapter (CEPA): 117.94 kg / 260 lbs
  - SDS: 149.75 kg / 330 lbs
- Size:
  - External Height: 67.56 inches (Height Exception to the GPV approved, MAGIK analysis shows no issues)
  - External Width: 47.92 inches (CEPA with handrails)
  - External Depth: 53.00 inches (CEPA with handrails)
- Power
  - 40W: SDS operating without heaters
  - 155W: SDS operating with ISS heaters
  - 100W: SDS non-operating with launch heaters

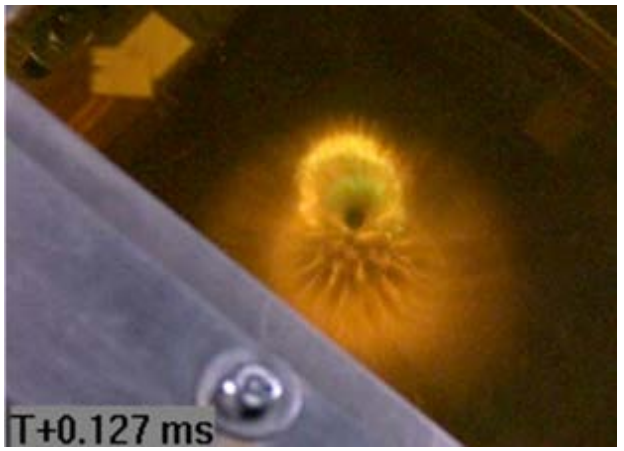
3-Layer Assembly



Detection Principles

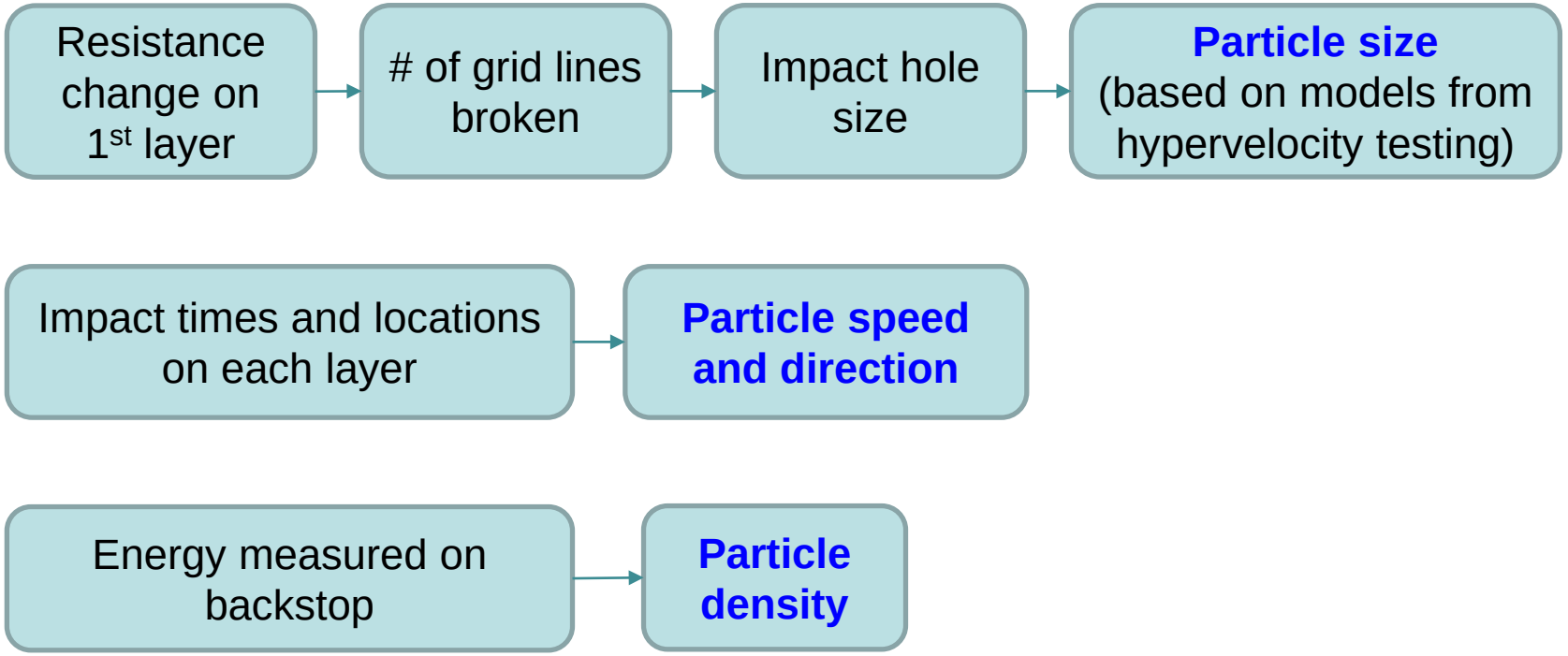
- SDS combines dual-layer thin films, an acoustic sensor system, a resistive grid sensor system, and sensored backstop to provide excellent semi-real-time impact detection and recording capability
  - Impact data includes: **Impact time, impact flux, particle size, impact speed, impact direction, and impact energy/particle density**





SDS Detection Coverage

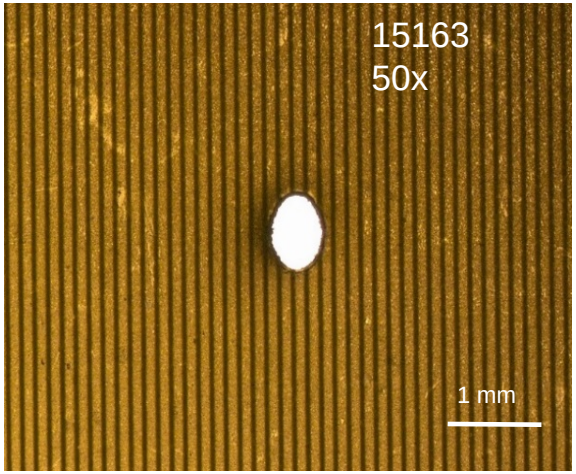
- Impacts on SDS will provide information to categorize orbital debris
  - **Speed** and **Direction** to categorize object origin (Inclination, Eccentricity)
  - **Size** and **Density**



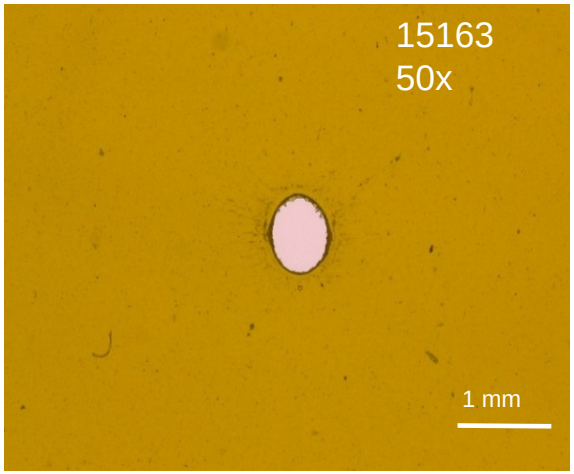
500µm 440C Stainless Steel

- Steel maintains shape throughout, impacts all 3 layers
- No visible break up of particles during impacts

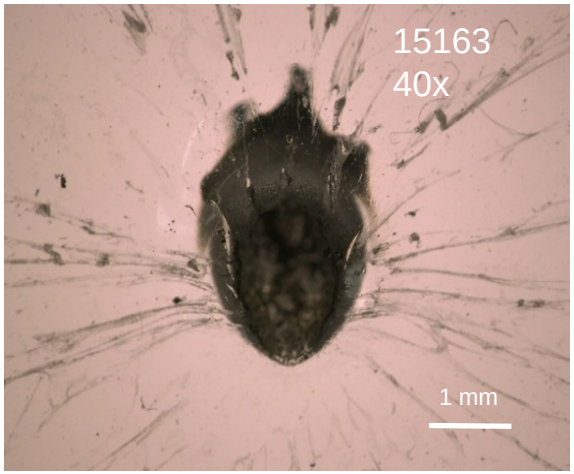
Layer 1



Layer 2



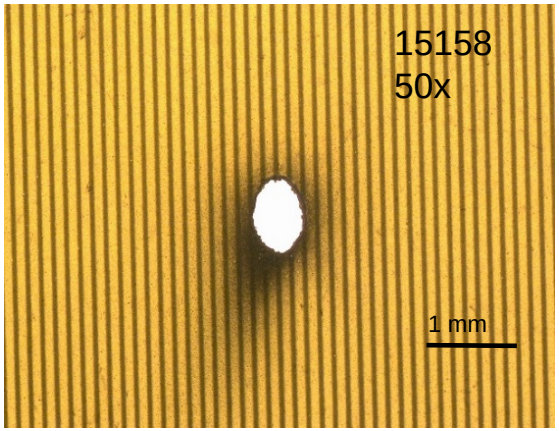
Backstop



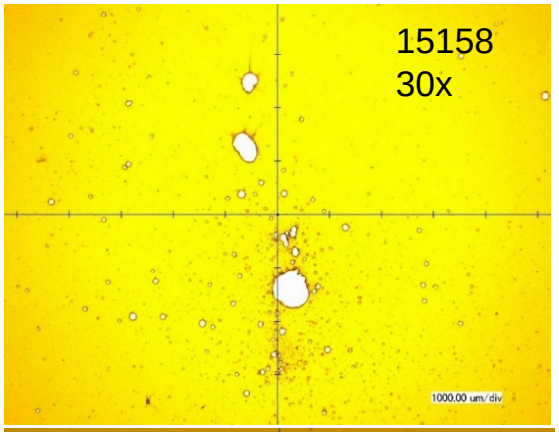
500µm Aluminum Al 2017-T4

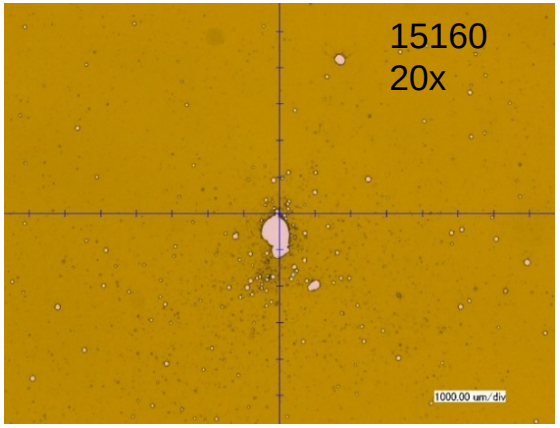
- Aluminum particles show break-up after 1st layer
- Multiple impact holes on 2nd layer

Layer 1

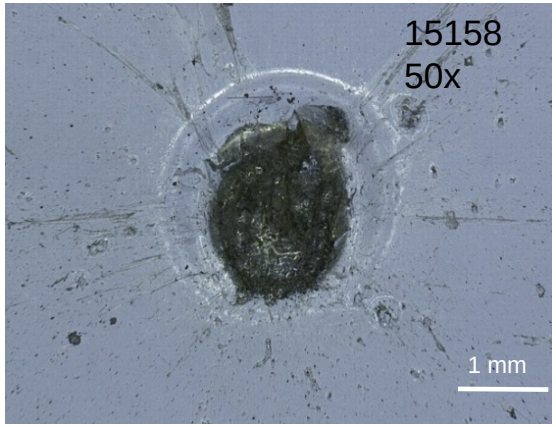


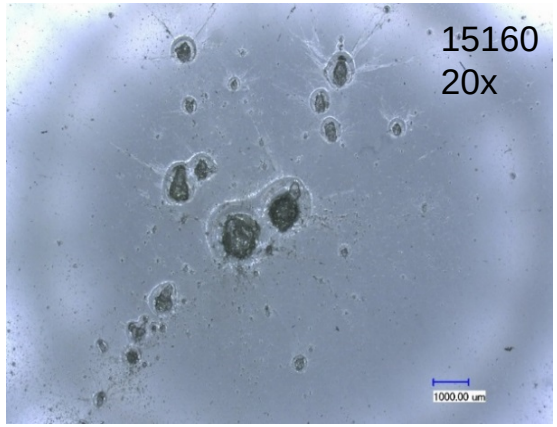
Layer 2





Backstop

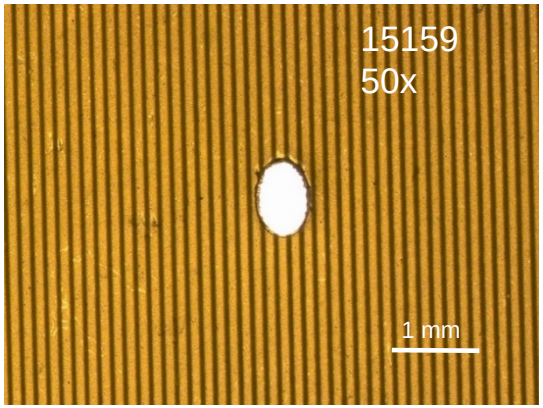




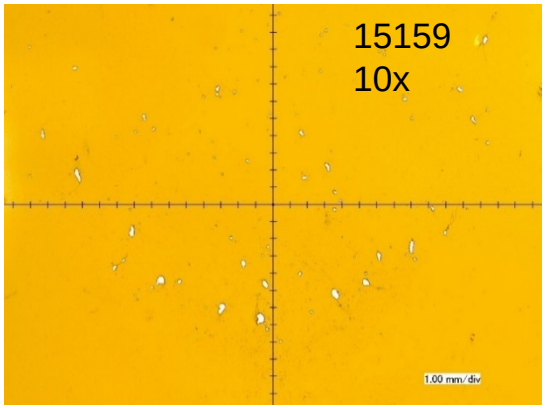
500µm PMMA Plexiglass

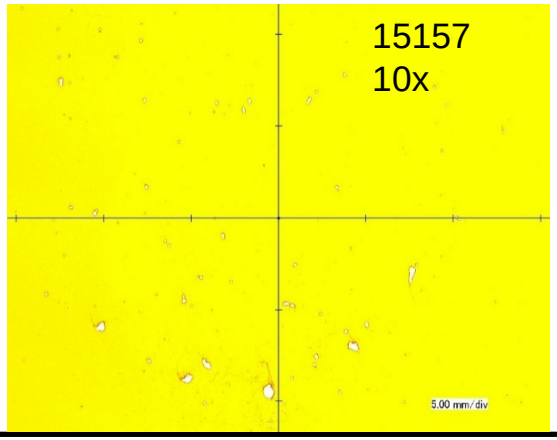
- Plastic particles break up significantly after 1st layer
- Multiple small impact holes on 2nd layer
- Residue only on Lexan backstop, if shot shows up at all

Layer 1

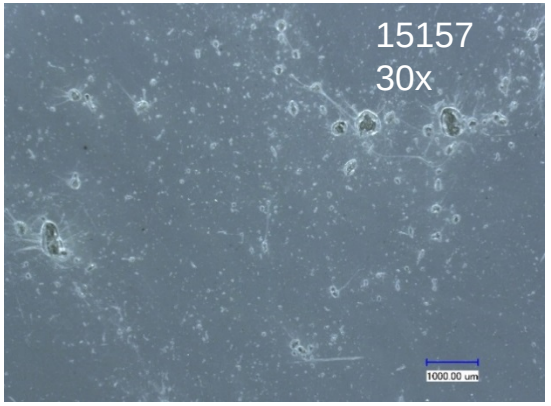


Layer 2



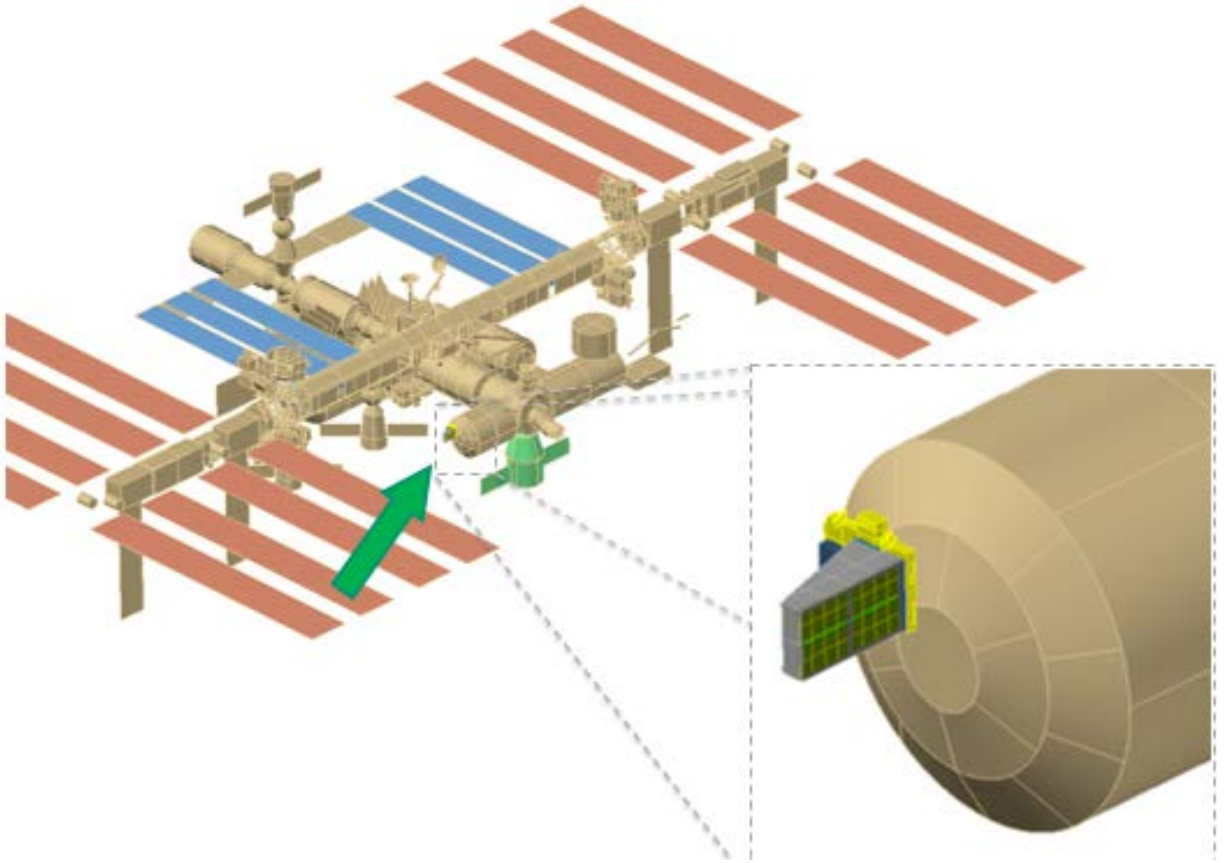


Backstop

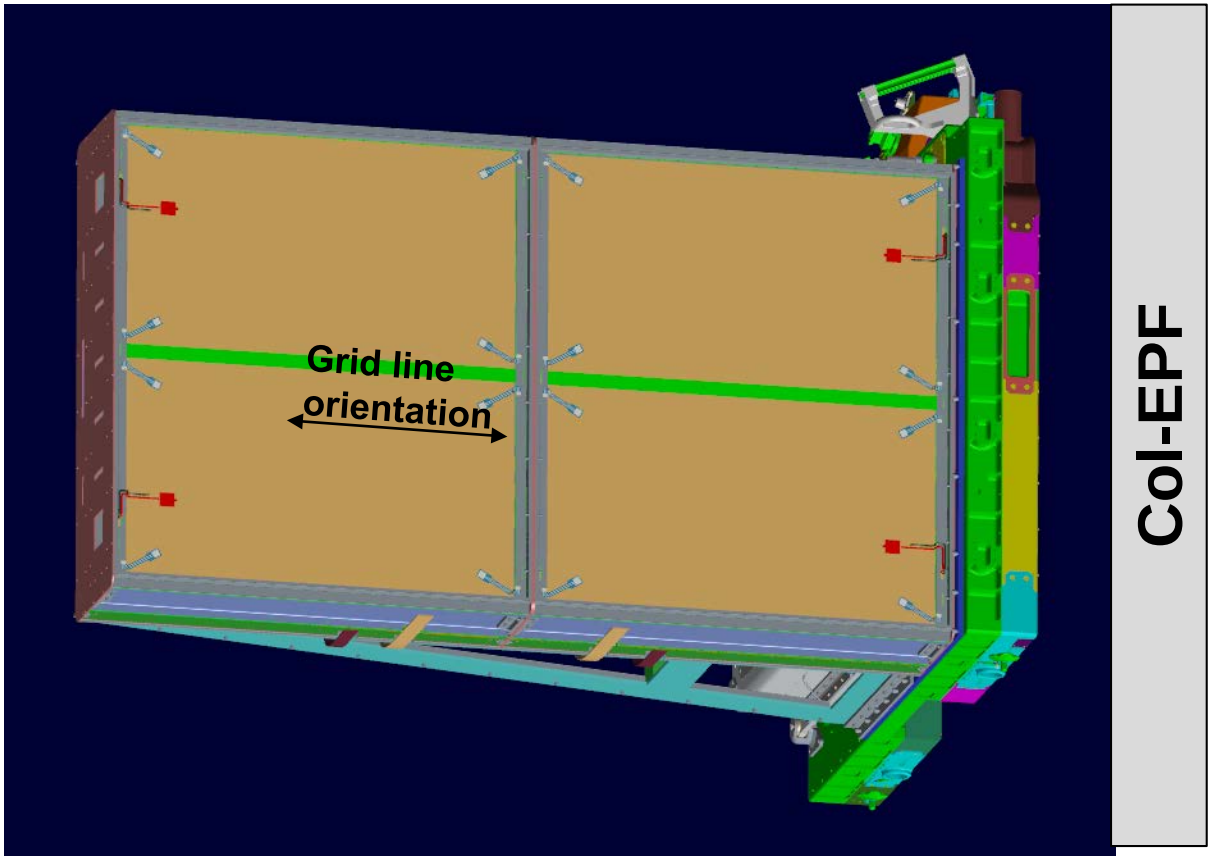


SDS Installation on ISS

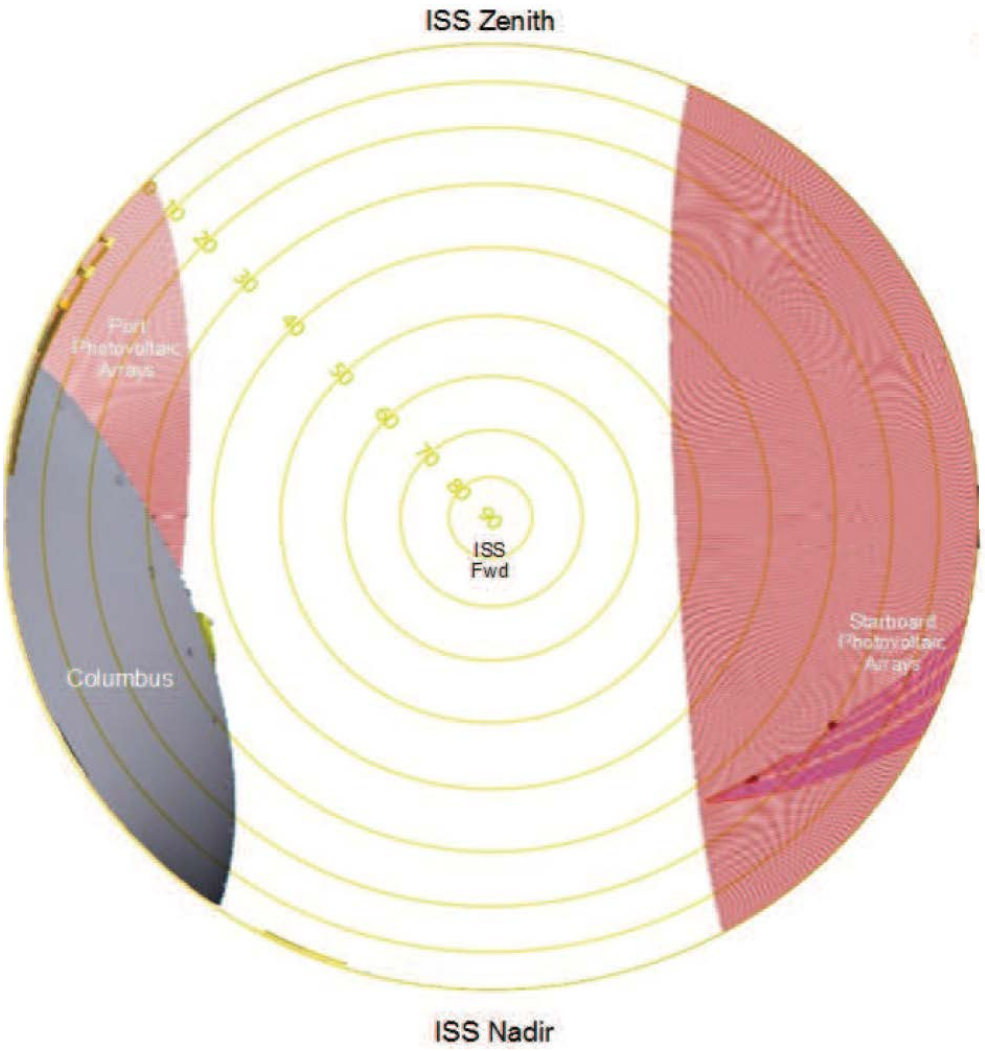
- SDS scheduled to launch on SpaceX 13 (Nov. 2017)
- Installation on the Columbus External Payload Facility (Col-EPF) in the ISS forward-facing (ram) direction



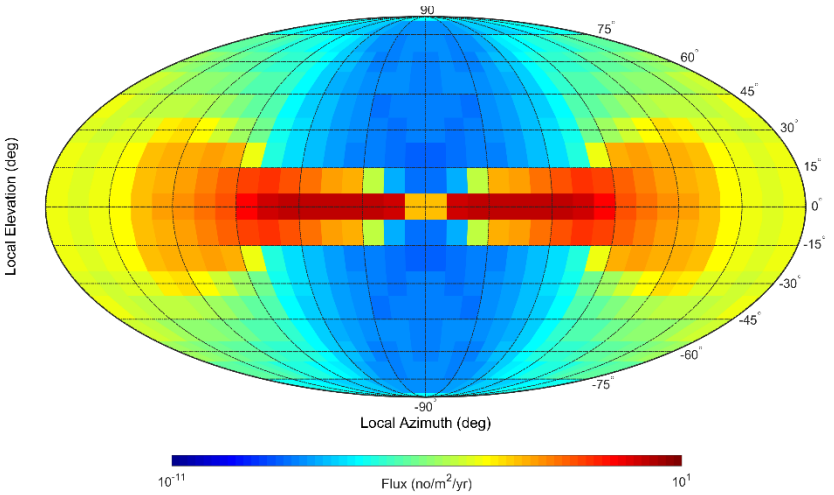
SDS ISS Orientation



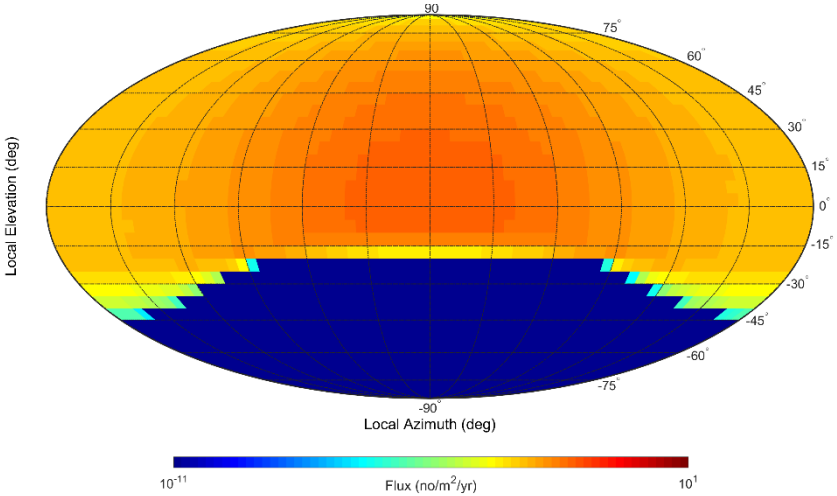
SDS Field of View



2D directional flux, orbital debris



2D directional flux, micrometeoroids



Questions?

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